Geology and Topography of Ra Patera, Io, in the Voyager Era: A Basis for Comparison with HST-Era Changes

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Hubble Space Telescope and Galileo images reveal profound changes at the shield volcano Ra Patera on Io in the past 3 years. To understand the environment in which these changes took place and to assess possible controlling factors, we use Voyager stereo, color, and high-resolution images to map the geology of Ra Patera, including new detailed topographic maps of the region. The highest topography in the Ra Patera area occurs in a thick deposit adjacent to Huo Shen caldera 200 km due south of Ra, and in a mesa and ridge complex that begins just 40 km east of the Ra caldera. This ridge is 2 to 5 km high and extends eastward from Ra for 250 km before turning north. Ra Patera itself is 2.5 km high relative to surrounding plains, an elevation typical of shield volcanoes on Io. Most of the relief at Ra is concentrated within 50 km of the summit area. Longitudinal flows at Ra occur on the broad nearly flat flanks of the volcano, where slopes average 0.5 degrees or less. These data suggest that the most prominent topographic control on flow morphology at Ra Patera occurs immediately due east of the caldera. They also demonstrate how high-quality Voyager-based topographic mapping provides a useful base with which to study volcanic changes on Io observed by HST and Galileo.

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